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## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 3177-66349	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US00/15178	International filing date (day/month/year) 01 June 2000 (01.06.2000)	Priority date (day/month/year) 01 June 1999 (01.06.1999)
International Patent Classification (IPC) or national classification and IPC IPC(7): B29C 45/14, 45/16; F16K 24/04 and US Cl.: 137/43, 202, 588, 590, 592; 251/144; 264/219, 248, 250, 274, 275		
Applicant STANT MANUFACTURING, INC.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.

This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 11 sheets.

3. This report contains indications relating to the following items:

- I  Basis of the report
- II  Priority
- III  Non-establishment of report with regard to novelty, inventive step and industrial applicability
- IV  Lack of unity of invention
- V  Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI  Certain documents cited
- VII  Certain defects in the international application
- VIII  Certain observations on the international application

Date of submission of the demand 29 December 2000 (29.12.2000)	Date of completion of this report 14 August 2001 (14.08.2001)
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230	Authorized officer  EDMUND H LEE Telephone No. 703.308.0661

Form PCT/IPEA/409 (cover sheet)(July 1998)

**I. Basis of the report**

## 1. With regard to the elements of the international application:\*

- the international application as originally filed.  
 the description:

pages 1-12 as originally filed  
 pages NONE, filed with the demand  
 pages \_\_\_\_\_, filed with the letter of 22 June 2001 (22.06.2001)

- the claims:

pages NONE, as originally filed  
 pages NONE, as amended (together with any statement) under Article 19  
 pages 14-23, filed with the demand  
 pages NONE, filed with the letter of \_\_\_\_\_

- the drawings:

pages 2-7, as originally filed  
 pages 1, filed with the demand  
 pages NONE, filed with the letter of \_\_\_\_\_

- the sequence listing part of the description:

pages NONE, as originally filed  
 pages NONE, filed with the demand  
 pages NONE, filed with the letter of \_\_\_\_\_

## 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).  
 the language of publication of the international application (under Rule 48.3(b)).  
 the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

## 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in printed form.  
 filed together with the international application in computer readable form.  
 furnished subsequently to this Authority in written form.  
 furnished subsequently to this Authority in computer readable form.  
 The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.  
 The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4.  The amendments have resulted in the cancellation of:

- the description, pages NONE  
 the claims, Nos. NONE  
 the drawings, sheets/fig NONE

5.  This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

**WRITTEN OPINION**International application No.  
PCT/US00/15178**V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. STATEMENT**

Novelty (N)	Claims <u>1-34</u>	YES
	Claims <u>NONE</u>	NO
Inventive Step (IS)	Claims <u>1-34</u>	YES
	Claims <u>NONE</u>	NO
Industrial Applicability (IA)	Claims <u>1-34</u>	YES
	Claims <u>NONE</u>	NO

**2. CITATIONS AND EXPLANATIONS**

Claims 1-34 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest a method of providing a tank mount of weldable plastic material and injection molding/filling a mold containing the mount to form a valve component molded over the mount. The prior art also does not teach or fairly suggest a vent apparatus including a valve housing of non-weldable plastic material and a tank mount of weldable material coupled to the top of the wall of the valve housing. In addition, the claimed inventions have utility in the automotive industry.

----- NEW CITATIONS -----

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US00/15178

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) :B29C 45/14, 45/16; F16K 24/04

US CL :137/43, 202, 588, 590, 592; 251/144; 264/219, 248, 250, 274, 275

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 137/43, 202, 588, 590, 592; 251/144; 264/219, 248, 250, 274, 275

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

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**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,730,652 A (BARTHOLOMEW) 15 March 1988, see entire document.	1-33
Y	US 5,139,043 A (HYDE et al) 18 August 1992, see entire document.	1-33
Y	US 5,404,907 A (BENJEY et al) 11 April 1995, see entire document.	1-33
Y,P	US 5,954,091 A (LEADFORD) 21 September 1999, see entire document.	1-33
Y,P	US 6,035,883 A (BENJEY) 14 March 2000, see entire document.	1-33
Y,P	US 6,085,771 A (BENJEY et al) 11 July 2000, see entire document.	1-33

Further documents are listed in the continuation of Box C.

See patent family annex.

•	Special categories of cited documents:	
"A"	document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier document published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

11 JULY 2000

Date of mailing of the international search report

06 SEP 2000

Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
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## CLAIMS

1. A method of forming a vent apparatus adapted to be coupled to a fuel tank, the method comprising the steps of

5 providing a tank mount made of a weldable plastics material and adapted to be welded to an exterior surface of a fuel tank and injecting a non-weldable plastics material into a valve housing mold cavity containing the tank mount to overmold the tank mount with the non-weldable plastics material to produce a valve housing having a venting outlet arranged to 10 communicate with a valve chamber formed in the valve housing and arranged to extend above the tank mount.

2. The method of claim 1, wherein the providing step includes the steps of forming a tank mount mold to include an annular tank mount mold cavity having an L-shaped cross section and injecting a weldable plastics material into the 15 annular tank mount mold cavity to produce a ring-shaped tank mount having an L-shaped cross section.

3. The method of claim 2, wherein the ring-shaped tank mount includes an annular foot including a downwardly facing bottom surface adapted to be welded to an exterior surface of a fuel tank to support the valve housing in an aperture 20 formed in the fuel tank and an annular arm coupled to the annular foot and arranged to extend radially inwardly and include an inner rib and the step of injecting a non-weldable plastics material into a valve housing mold cavity includes the steps of forming a valve housing mold to include an inner rib encapsulation portion surrounding the inner rib and filling the inner rib encapsulation portion with non-weldable plastics 25 material to encapsulate the inner rib to mechanically couple the valve housing to the ring-shaped tank mount.

4. The method of claim 1, wherein the providing step includes the steps of forming a tank mount mold to include an annular tank mount mold cavity having a T-shaped cross section and injecting a weldable plastics material into the 30 annular tank mount mold cavity to produce a ring-shaped tank mount having a T-shaped cross section.

5. The method of claim 4, wherein the step of injecting a non-weldable plastics material into a valve housing mold cavity includes the steps of forming a valve housing mold to include an annular tank mount encapsulation portion surrounding all but a downwardly facing bottom surface of a foot of the ring-shaped tank mount having a T-shaped cross section contained in the valve housing mold and filling the annular tank mount encapsulation portion with the non-weldable plastics material to encapsulate the ring-shaped tank mount to mechanically couple the valve housing to the ring-shaped tank mount yet expose the downwardly facing bottom surface of the foot of the ring-shaped tank mount to adapt the tank mount to be  
10 welded to an exterior surface of a fuel tank to support the valve housing in an aperture formed in the fuel tank.

6. The method of claim 1, wherein the providing step includes the steps of forming a tank mount mold to include an annular tank mount mold cavity having a J-shaped cross section and injecting a weldable plastics material into the  
15 annular tank mount mold cavity to produce a ring-shaped tank mount having a J-shaped cross section.

7. The method of claim 6, wherein the step of injecting a non-weldable plastics material into a valve housing mold cavity includes the steps of forming a valve housing mold to include an encapsulation portion surrounding an  
20 annular upper portion of the ring-shaped tank mount, the annular upper portion having a T-shaped cross section, and a foot portion defining an annular lower portion of the ring-shaped tank mount coupled to the annular upper portion and positioned to lie below the encapsulation portion, filling the encapsulation portion with non-weldable plastics material to mechanically couple the valve housing to the ring-shaped tank  
25 mount, and filling the foot portion with non-weldable plastics material to produce the ring-shaped tank mount having a J-shaped cross section and to provide a downwardly facing bottom surface on the annular lower portion of the ring-shaped tank mount that is adapted to be welded to an exterior surface of a fuel tank to support the valve housing in an aperture formed in the fuel tank.

30 8. A method of forming a vent apparatus adapted to be coupled to a vehicle fuel tank, the method comprising the steps of

providing a weldable tank mount formed to include an inner rim and to define a passageway and a plastic injection mold including an upper mold portion and a lower mold portion such that the upper and lower mold portions are movable between an open position adapted to receive the weldable tank mount and a closed position adapted to retain the weldable tank mount therein,

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moving the upper and lower mold portions to the opened position, placing the weldable tank mount within one of the upper and lower mold portions of the mold cavity,

moving the upper and lower mold portions to the closed position to  
10 retain the weldable tank mount within the mold cavity,

filling the upper and lower mold portions with a non-weldable liquid plastics material to form a fuel systems valve component around the weldable tank mount such that the fuel systems valve component is formed to include a channel and the inner rim of the weldable tank mount is received within the channel so that the weldable tank mount is mechanically coupled to the fuel systems valve component to produce an apparatus adapted to be coupled to a fuel tank,

cooling the liquid plastics material to establish a mechanical bond  
between the weldable tank mount and the fuel systems valve component,  
moving the upper and lower mold portions to the opened position, and  
removing the apparatus from the cavity.

9. The method of claim 8, wherein the lower mold portion is formed to define a sleeve-forming cavity and the upper mold portion is formed to define a top wall-forming cavity and an outlet-forming cavity.

10. The method of claim 9, wherein providing the plastic injection  
mold further includes the step of providing a passageway defined by the lower mold  
portion and formed to receive liquid plastics material so that the liquid plastics material  
is injected into the sleeve-forming cavity first, the top wall-forming cavity second, and  
the outlet-forming cavity third.

11. A method of forming vent apparatus adapted to be coupled to a  
30 fuel tank, the method comprising the steps of

providing a tank mount formed from a weldable plastics material and formed to include a body having a T-shaped cross-section and also providing a plastic

- injection mold formed to include an upper mold portion and a lower mold portion, the upper and lower mold portions being movable between an opened position adapted to receive the tank mount and a closed position adapted to retain the tank mount therein,
- moving the upper and lower mold portions to the opened position,
- 5 placing the tank mount within one of the upper mold portion and the lower mold portion of the plastic injection mold,
- moving the upper and lower mold portions to the closed position to retain the tank mount within the plastic injection mold,
- filling the upper and lower mold portions with a non-weldable liquid
- 10 plastics material to form a valve housing around the tank mount formed to define a top wall having an annular flange defining a T-shaped channel formed to receiving the tank mount therein to cause the tank mount to be mechanically coupled to the valve housing,
- cooling the liquid plastics material to establish a mechanical bond
- 15 between the tank mount and the fuel systems valve component,
- moving the upper and lower mold portions to the opened position, and
- removing a unit including the valve housing and tank mount from the plastic injection mold.
12. A method of forming a vent apparatus adapted to be coupled to
- 20 a fuel tank, the method comprising the steps of
- providing a tank mount formed from a weldable plastics material and formed to include a body having a T-shaped portion and a base portion coupled to the T-shaped portion and also providing a plastic injection mold formed to include an upper mold portion and a lower mold portion wherein the upper and lower mold
- 25 portions are movable between an opened position adapted to receive the tank mount and a closed position adapted to retain the tank mount therein,
- moving the upper and lower mold portions to the opened position,
- placing the tank mount within one of the upper mold portion and the lower mold portion of the plastic injection mold,
- 30 moving the upper and lower mold portions to the closed position to retain the tank mount within the plastic injection mold,

filling the upper and lower mold portions with a non-weldable liquid plastics material to form a valve housing around the tank mount formed to define a top wall having an annular flange defining a T-shaped channel formed to receiving the T-shaped portion of the tank mount therein to cause the tank mount to be mechanically coupled to the valve housing,

cooling the liquid plastics material to establish a mechanical bond between the tank mount and the fuel systems valve component,

moving the upper and lower mold portions to the opened position, and removing the valve housing and tank mount combination from the

plastic injection mold.

13. A vent apparatus adapted to be coupled to a vehicle fuel tank, the apparatus comprising

a valve housing made from a non-weldable plastics material and formed to include a cylindrical sleeve defining an interior region, a top wall coupled to the cylindrical sleeve and formed to include an aperture and an annular flange defining an annular channel, and a venting outlet coupled to the top wall at the aperture and provided to conduct fuel and fuel vapor from the interior region of the cylindrical sleeve to another destination outside the valve housing,

20 a valve positioned to lie within the interior region of the cylindrical sleeve and formed to move within the interior region of the cylindrical sleeve to open and close the aperture defined by the top wall of the valve housing which leads to the venting outlet, and

25 a tank mount made from a weldable plastics material, coupled to the top wall of the valve housing, and formed to include an outer rim adapted to be coupled to the fuel tank to support the cylindrical sleeve within the tank, an annular rib formed to be received within the annular channel of the flange of the top wall, and a top wall coupled to and positioned to lie between the outer rim and the annular rib, the tank mount being positioned to cause the top wall of the tank mount and the top wall of the valve housing to lie in coplanar relation with one another.

30 14. The apparatus of claim 13, wherein the tank mount is ring-shaped and is further formed to include an annular interior wall defining an opening formed to receive the top wall of the valve housing, and the annular inner rib of the

tank mount is coupled to the annular interior wall and is formed to extend into the opening.

15. The apparatus of claim 14, wherein the interior wall of the tank mount includes an upper face and a lower face and the annular inner rib is positioned to lie midway between the upper face and the lower face.

16. The apparatus of claim 14, wherein the top wall of the tank mount is positioned to extend radially outwardly from the interior wall and the outer rim of the tank mount is coupled to the top wall of the tank mount, formed to extend radially downwardly from the top wall of the tank mount, and formed to include a bottom face adapted to be coupled to the fuel tank.

17. The apparatus of claim 14, wherein the inner rib is formed to define a notch and the flange of the valve housing is formed to include a locator tab to be received within the notch in order to prevent rotation between the tank mount and the valve housing.

18. The apparatus of claim 13, wherein the venting outlet of the valve housing is positioned to lie above the tank mount and the cylindrical sleeve of the valve housing is positioned to lie below the tank mount.

19. The apparatus of claim 13, wherein the top wall of the tank mount further includes a top surface and a bottom surface and the outer rim of the tank mount includes an outer surface and an inner surface, and wherein the top surface of the top wall has a length, X, and the outer surface of the outer rim has a height, Y, and further wherein X is greater than Y.

20. A vent apparatus adapted to be coupled to a fuel tank, the apparatus comprising

25 a valve housing formed to include a cylindrical sleeve defining an interior region, a top wall coupled to the cylindrical sleeve and formed to include an aperture and an annular flange defining an annular channel, and a venting outlet coupled to the top wall at the aperture in order to conduct fuel and fuel vapor from the interior region of the cylindrical sleeve to another destination outside the valve housing,

a valve positioned to lie within the interior region of the cylindrical sleeve and formed to move within the interior region of the cylindrical sleeve to open and close the aperture defined by the top wall of the valve housing, and

- 5 a tank mount coupled to the top wall of the valve housing and formed  
to include an outer rim adapted to be coupled to the fuel tank to support the cylindrical sleeve within a mounting aperture of the tank and an annular rib formed to be received within the annular channel of the flange, and wherein the valve housing includes a locator tab coupled to the annular flange and the annular rib includes a notch formed to receive the locator tab of the valve housing in order to prevent rotation between the  
10 valve housing and the tank mount.

21. The apparatus of claim 20, wherein the tank mount includes a top wall and the venting outlet of the valve housing is positioned to lie above the top wall of the tank mount and the cylindrical sleeve of the valve housing is positioned to lie below the top wall of the tank mount.

- 15 22. The apparatus of claim 21, wherein the tank mount further includes an interior wall defining an opening for receiving the top wall of the valve housing therein and the inner rib of the tank mount is coupled to the interior wall and positioned to extend into the opening of the tank mount, and wherein the tank mount further includes a top wall positioned to extend radially outwardly from the interior  
20 wall, and the outer rim is coupled to the top wall and is positioned to extend radially downwardly from the top wall.

- 25 23. The apparatus of claim 21, wherein the valve housing is made from a non-weldable plastics material and the tank mount is made from a weldable plastics material and the inner rib of the tank mount is received within the channel of the flange of the top wall of the valve housing to cause the tank mount to be mechanically coupled to the valve housing.

24. A vent apparatus adapted to be coupled to a fuel tank, the apparatus comprising  
30 a valve housing made from a non-weldable plastics material and formed to include a cylindrical sleeve defining an interior region, a top wall coupled to the cylindrical sleeve and formed to include an aperture and an annular flange having an interior opening forming a channel adapted to face the fuel tank, and a venting outlet

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coupled to the top wall at the aperture and provided to conduct fuel and fuel vapor from the interior region of the cylindrical sleeve to another destination outside the valve housing,

5        a valve positioned to lie within the interior region of the cylindrical sleeve and formed to move within the interior region of the cylindrical sleeve to open and close the aperture defined by the top wall of the valve housing which leads to the venting outlet, and

10      a tank mount made from a weldable plastics material and formed to be received within the channel of the flange of the top wall of the valve housing to cause the flange to completely surround the tank mount, the tank mount having a bottom surface adapted to be weldably coupled to the fuel tank in order to support the valve housing within a mounting aperture formed in the fuel tank.

25.     The apparatus of claim 24, wherein the tank mount forms a T-shaped cross section and the channel of the flange of the valve housing is similarly formed to define a T-shaped cross-section.

26.     The apparatus of claim 25, wherein the tank mount includes a horizontal portion and a vertical portion coupled to the horizontal portion at a first end and adapted to be weldably coupled to the fuel tank at a second end defining the bottom surface.

20       27.    The apparatus of claim 25, wherein the tank mount is further formed to define a notch and the flange of the valve housing includes a locator tab formed to be received within the notch of the tank mount in order to prevent rotation between the tank mount and the valve housing.

25       28.    The apparatus of claim 24, wherein the annular flange of the valve housing is formed to include a top wall coupled to the top wall of the valve housing, opposite side walls positioned to lie in spaced-apart relation to each other, and a tab portion coupled to each side wall in order to define the T-shaped channel.

29.     A vent apparatus adapted to be coupled to a fuel tank, the apparatus comprising

30       a valve housing made from a non-weldable plastics material and formed to include a cylindrical sleeve defining an interior region, a top wall coupled to the cylindrical sleeve and formed to include an aperture and an annular flange having an

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interior opening forming a channel adapted to face the fuel tank, and a venting outlet coupled to the top wall at the aperture and provided to conduct fuel and fuel vapor from the interior region of the cylindrical sleeve to another destination outside the valve housing,

5           a valve positioned to lie within the interior region of the cylindrical sleeve and formed to move within the interior region of the cylindrical sleeve to open and close the aperture defined by the top wall of the valve housing which leads to the venting outlet, and

10          a tank mount made from a weldable plastics material, formed to include a T-shaped portion formed to be received within the channel of the flange of the top wall of the valve housing to cause the flange to completely surround the T-shaped portion and a base portion coupled to the T-shaped portion and adapted to be weldably coupled to the fuel tank in order to support the valve housing within a mounting aperture of the fuel tank.

15          30.       The apparatus of claim 29, wherein the flange of the valve housing is formed to include a locator tab and the T-shaped portion of the tank mount is formed to define a notch formed to receive the locator tab therein to prevent rotation of the tank mount relative to the valve housing.

20          31.       The apparatus of claim 29, wherein the T-shaped portion is formed to include a horizontal portion and a vertical portion coupled to the horizontal portion at a first end and coupled to the base portion at a second end, and the base portion is formed to include a top surface coupled to the vertical portion, an interior surface, and exterior surface, and a bottom surface adapted to be coupled to the fuel tank.

25          32.       The apparatus of claim 31, wherein the flange is formed to include an outer side wall and the outer side wall is positioned to lie in coplanar relation with the exterior surface of the base portion of the tank mount.

30          33.       The apparatus of claim 31, wherein the annular flange of the valve housing is formed to include a top wall coupled to the top wall of the valve housing, opposite side walls positioned to lie in spaced-apart relation to each other, and a tab portion coupled to each side wall in order to define the T-shaped channel.

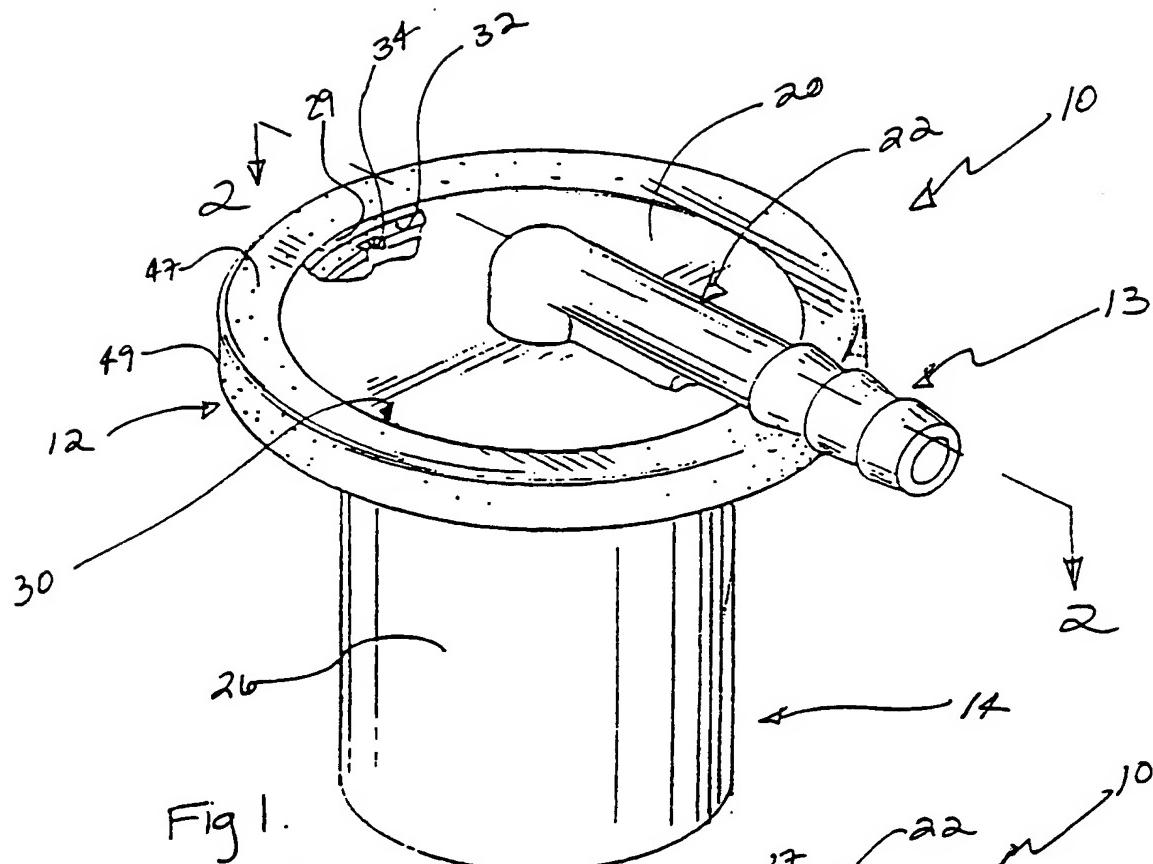


Fig. 1.

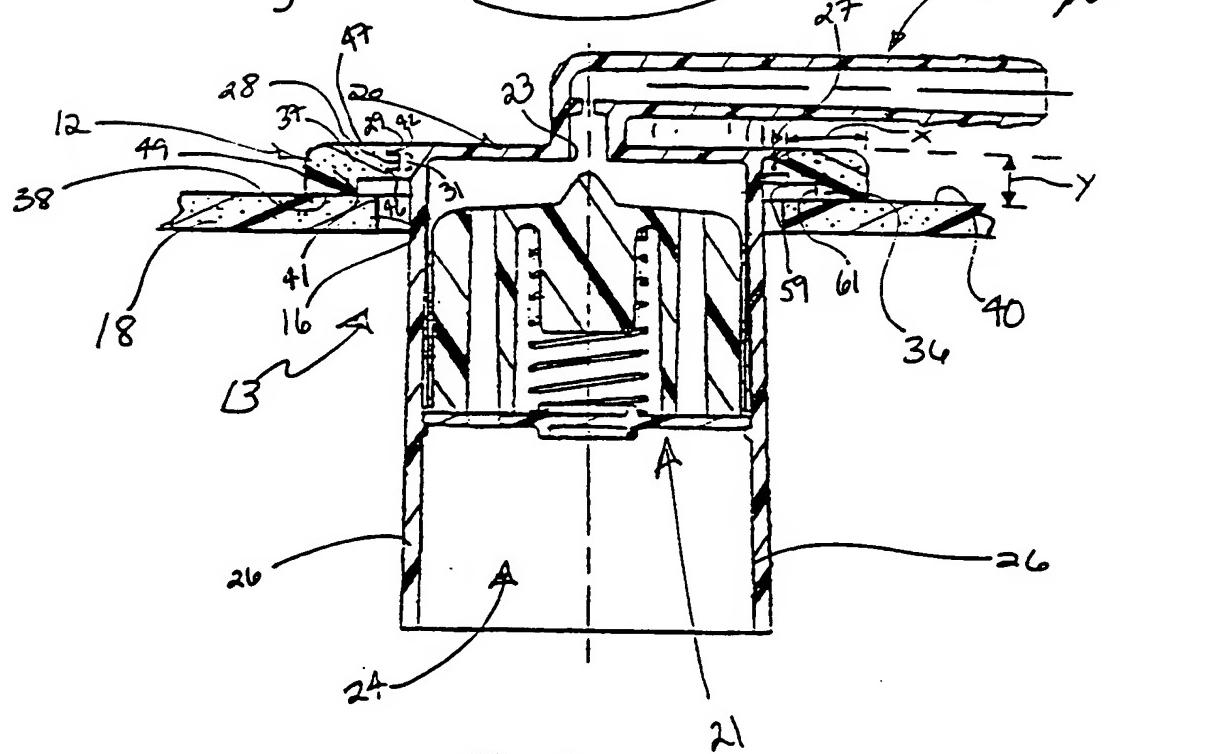


Fig. 2